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SCI Panel Perspectives on Systems Integration

Mike Woodhead

Professor of Systems Engineering
Loughborough University
Loughborough, Leicestershire LE11 3TU
United Kingdom

SUMMARY

The need to adopt a systems engineering approach throughout the defence acquisition cycle, in order to ensure satisfactory system integration, has been recognised in recent years. In the UK, the 1997 Strategic Defence Review resulted in *Smart Procurement* which has been introduced as a result of a number of factors such as cost over-runs and slippage, increasing complexity and diversity in defence systems, rapidly advancing technologies, and the changing defence industry structure in the USA and UK.

The Smart Procurement lifecycle is being introduced particularly to ease the acquisition of large-scale battlespace systems of systems. Such systems can be perceived to be federations of autonomous or semi-autonomous sub-systems, in implemented operational terms. Nevertheless, throughout system development there has to be a fully-integrated, functionally-based system of systems concept without which a rational approach to the incorporation of legacy systems cannot exist. This fundamental concept has to be fully-integrated yet flexible, since it also forms the basis for successful system evolution to accommodate component obsolescence, technology inserts, etc.

Smart Procurement is being introduced at a time of increasing uncertainty in terms of capability requirements and the rate of technological change. A whole-life systems engineering approach enables the acquisition cycle to become smarter and to control programme costs whilst taking advantage of the evolutionary opportunities for system capability provided by technology inserts. To this end, the primary need is to develop system architectures which can facilitate evolutionary change over the lifecycle of the system.

It is important to recognise that these smart architectures have to be provided at the system concept level. For too long we have tried to use software techniques to compensate for fundamental weaknesses in systems -- this has 'papered over cracks' but has not provided a satisfactory long-term solution. In developing satisfactory system architectures, a systems of systems perception should be adopted at all levels in the system, and will impact upon system partitioning for integrated modular architectures.

There is a clear need to develop modelling and analysis capability in order to best configure the architecture of evolving systems in the knowledge that they will have to accommodate evolutionary change. This becomes an important development in improving the defence industry's capability, as a system integrator, to develop evolving defence systems more affordably.

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